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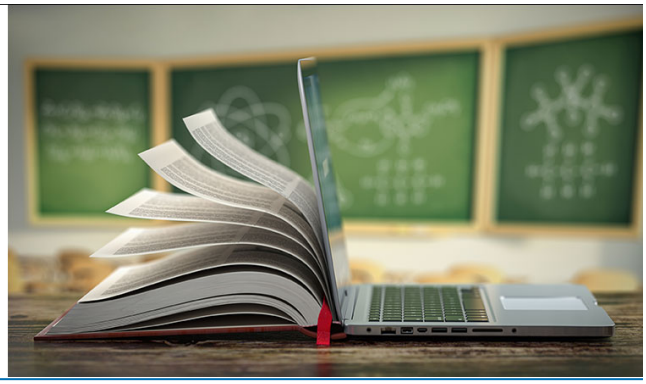
To cite this article: E A Kubina *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **666** 062121



Determination of Effective Capitalization Rates for Commercial Real Estate

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Abstract. For effective management of the commercial real estate, it is important to determine the capitalization rate. For this purpose, the revenue approach is used. In order for the result to be real for each segment of commercial real estate, it is important to determine the capitalization rates as accurately as possible. This article discusses two methods for calculating the capitalization rate. For the purity of the experiment, the same commercial real estate items in three different segments were used for both methods. This is an office, retail and industrial warehouse. Based on the comparison, one of the two options is selected, which is optimal and detailed. All calculations were made on the example of the city of Yekaterinburg. The time period is six months. Based on the experience gained, the authors suggest using the data obtained for further calculation of the capitalization rate. For clarity of the results obtained, graphs of the dependence of values were compiled. To calculate this indicator, the authors formed a sample of 26 pairs of offers that were simultaneously in the status of full sale and lease. The article presents a constructive and consistent analysis of the capitalization rate calculation using various methods, as well as informative conclusions. We hope that this method will be useful for practical evaluation.

1. Introduction

Every entrepreneur faces the problem of choosing a commercial space. He was faced with a few questions. Invest your existing funds now? Buy out the proposed area? Can I rent it?

For each city, there are corresponding indicators of the capitalization rate for each segment of the commercial real estate market. They describe the general state of the market in a particular territorial zone [1].

This article will discuss two methods for calculating capitalization rates on the example of the city of Yekaterinburg. The main difference between the use of these methods is in the method of calculating the indicator and the accuracy of the result.

2. Problem statement

The calculated indicators are used to determine the best option when choosing between renting a commercial space or buying it [2,3].

To make the experiment "clean", the two methods used the same commercial real estate objects in three segments: office, retail, and production, and warehouse. The main condition was to find each room in the ads for sale and rent. A total of 26 such pairs were considered.

The purpose of the experiment is to identify differences in performance indicators for commercial real estate objects.

The relevance of this research is to choose the most accurate method for calculating the capitalization rate.

The novelty lies in the fact that for the city of Yekaterinburg (on the example of which the authors consider the differences in the use of two calculation methods) there are no effective indicators of the capitalization rate.

Before starting the study, the authors set the following tasks:

1) Analyze the calculation algorithm for two methods of finding the capitalization rate of commercial real estate;

2) Create a sample of 26 pairs of sale-lease offers for each segment of commercial real estate in Yekaterinburg;

3) perform the necessary calculations and create scatter diagrams;

4) Compare the resulting capitalization rate indicators and choose the most accurate one;

5) draw Meaningful conclusions.

The object of research is commercial real estate in the city of Yekaterinburg.

The subject of research is capitalization rates.

3. Literature review

When forming the algorithm for calculating the capitalization rate for commercial real estate, the authors used two methods: the pair of groups method and the group of pairs method. After analyzing the available sources, the authors concluded that there are not many relevant studies on this topic, and the capitalization rate for commercial real estate in Yekaterinburg was last updated more than five years ago.

The authors reviewed the main results and dynamics of the commercial real estate market. The trends put forward by experts based on the results of previous years and the analysis of investments in this industry are also analyzed [4-7].

4. Research of the group of pairs method

4.1. Creating a table and calculating the capitalization rate using the group of pairs method

The first method of a group of pairs on business objects for determining the capitalization rate of commercial real estate is easier to calculate, and the calculation of this method takes less time since offers are analyzed immediately for lease and sale offers [8].

Thus, the authors determined a sample for each segment of the commercial real estate market. For office and retail real estate, 10 pairs of objects were selected, both for rent and for sale. For industrial and warehouse real estate, the sample consisted of 6 pairs of objects.

The original sale and rental prices are shown in the table, taking into account the existing adjustments for the sale of real estate in the city. Ekaterinburg. These adjustments were obtained by the authors by deducing the average value from existing collections [9,10]. Thus, the following values were applied:

1) For office real estate: 9% (sale); 6% (rent)

2) for commercial real estate: 10% (sale); 6.5% (rent)

3) For industrial and warehouse real estate: 11% (sale); 7% (rent)

The calculated indicator was determined based on data from commercial real estate in the city of Yekaterinburg from the CIAN website [11]. In this method, the capitalization rate was calculated as the difference between the actual annual profit from leasing an object and the sale price.

The first step was to calculate the capitalization rate for sellers. It was calculated as the ratio of the profit from the annual lease (not including VAT) to the price for rent per month (not including VAT) (Table 1). The market capitalization rate was calculated as follows:

$$CR_{market} = \frac{Profit\ per\ year}{Price\ per\ month\ - \left(\frac{Price\ per\ month}{100}\right) * 15} \quad (1)$$

By adjusting for bidding between a seller and a potential buyer (assumed to be equal to 15%), the capitalization rates declared by the sellers were converted to market rates.

The average value, as well as the maximum and minimum, were found using Excel formulas.

Table 1. Calculation of the capitalization rate using the group of pairs method.

№ vapor	Property type	Price, RUB, not including VAT	Profit, RUB/year, not including VAT	Capitalization rate	
				Salespeople	Market
1	Offices	5775770	650856	0,11	0,13
2		4096547	430332	0,11	0,12
3		53894295	7492176	0,14	0,16
4		1377376	119116,8	0,09	0,1
5		11830000	1552128	0,13	0,15
6		245700000	25695840	0,1	0,12
7		86450000	19207584	0,22	0,26
8		54381600	6179184	0,11	0,13
9		100100000	12220977,6	0,12	0,14
10		23660000	3271200	0,14	0,16
1	Retail real estate	5085000	673200	0,13	0,16
2		7200000	795273,6	0,11	0,13
3		7650000	785400	0,1	0,12
4		8305200	1035381,6	0,12	0,15
5		10800000	1278631,2	0,12	0,14
6		20790000	1065900	0,05	0,06
7		55800000	8058765	0,14	0,17
8		55800000	6635844,6	0,12	0,14
9		39367800	2014775,4	0,05	0,06
10		31414500	4217598	0,13	0,16
1	Industrial and warehouse real estate	19437600	1499904	0,08	0,09
2		31750436	4464000	0,14	0,17
3		11650689,4	1126881	0,1	0,11
4		2598041,21	477648	0,18	0,22
5		3916495,21	725400	0,19	0,22
6		14335921,6	1834704	0,13	0,15
Offices	minimum				0,1
	average				0,15
	median				0,14
	Midpoint of the interval				0,18
	maximum				0,26
Retail real estate	minimum				0,06
	average				0,13
	median				0,14
	Midpoint of the interval				0,12
	maximum				0,17
Industrial	minimum				0,09

and ware-house real estate	average	0,16
	median	0,16
	Midpoint of the interval	0,15
	maximum	0,22

5. The formation of scatterplots

Next, the authors compiled scattering diagrams (see Fig. 1-3). On the OX axis – the offer price for sale (P, RUB.), on the OY axis – the market capitalization rate (MCR).

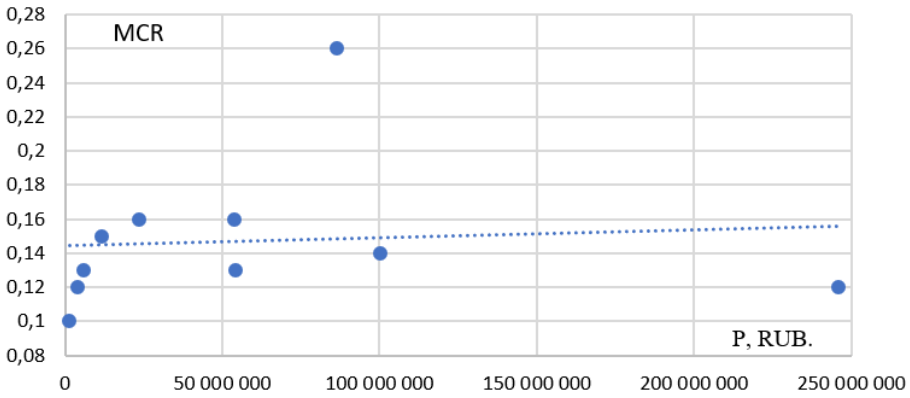

Figure 1. Scattering diagram "offer Price to sale market capitalization rate" for commercial real estate.

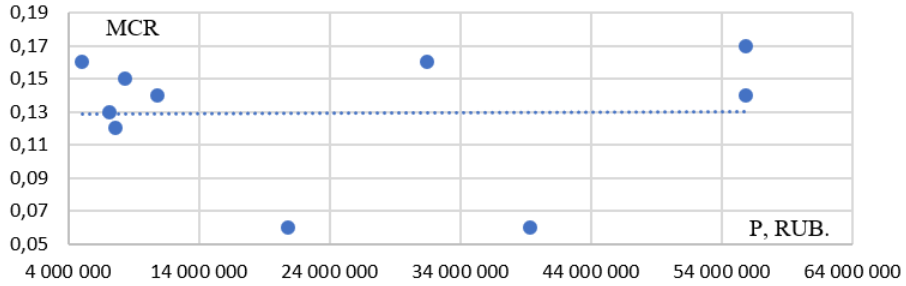

Figure 2. Scattering diagram "offer Price to sale market capitalization rate" for commercial real estate.

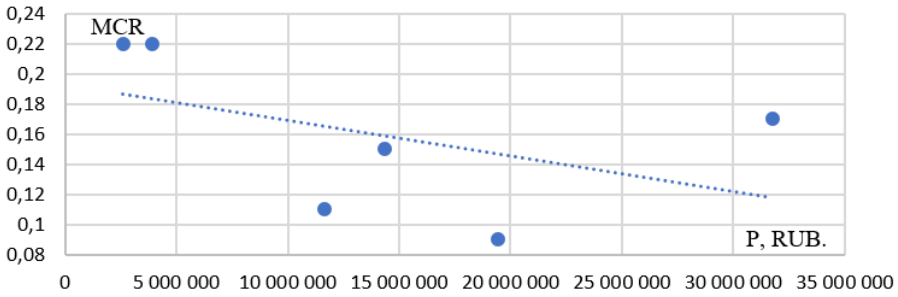

Figure 3. scatter plot "offer price for sale – market capitalization rate" for industrial and warehouse real estate.

As you can see from the scatter plots, office real estate indicators are close to the trend line, which means that the resulting value is quite close to the real one. Retail and industrial and warehouse real estate has a large spread of indicators from the trend line, which indicates that the output indicator is inaccurate.

Next, we will make histograms of the distribution of capitalization rates (see Fig. 4-6). The intervals for histograms were determined based on scatter plots: values below, on the line, and above the trend line (dotted line in fig. 1-3).

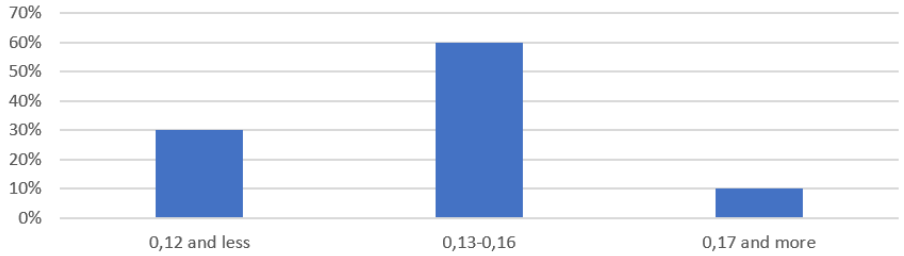

Figure 4. Histogram of the distribution of capitalization rates in office real estate.

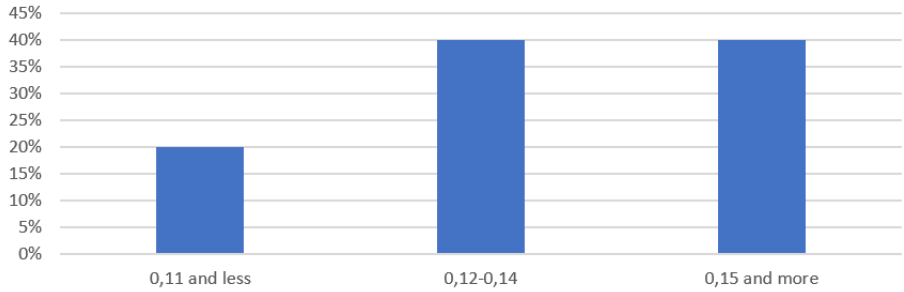

Figure 5. Histogram of the distribution of capitalization rates in retail real estate.

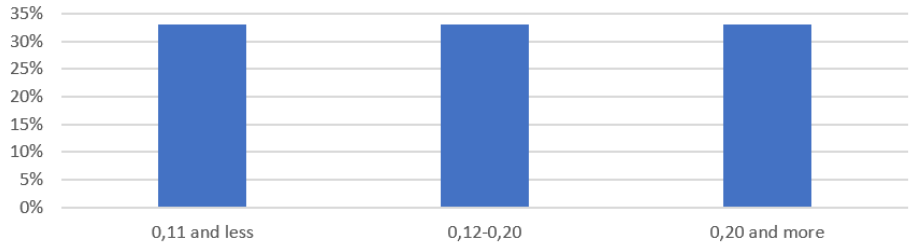

Figure 6. Histogram of the distribution of capitalization rates in industrial and warehouse real estate.

Thus, the situation with office real estate in the city of Yekaterinburg can be said to be unsymmetrical, and the capitalization rate of objects lies in the range of 0.13-0.16. This indicator is the interval with the largest number of values in the histogram. For commercial real estate, the dispersion is also asymmetric, and the capitalization rate is in the range of 0.12 or more. For industrial and warehouse real estate, the scattering is completely symmetrical, which means that it is impossible to determine values that are close to real values.

Next, we will determine the most likely value of the capitalization rate for each segment based on the values of three average indicators in table 1: median, average, and mid-range: Offices: 0.15-0.18 relative units per year; Retail real estate: 0.12-0.14 relative units per year; Production and storage facilities: 0.15-0.16 relative units per year.

Thus, comparing the intervals of the capitalization rate values from the histograms and the average values from table 1, the authors conclude that the capitalization rates are close to the distribution.

6. Research using the pair of groups method

In contrast to the previous method, the method of a pair of groups includes two stages of calculations, where the lease and sale of objects are considered separately [12]. In this method, the original indica-

tors of the cost of objects were adjusted for trading similar to the previous method. The sample used offers that do not include VAT, operating costs, and utility bills.

Table 2 shows a sample of commercial real estate by segment offered for rent. In the same place, VAT (value-added tax) rates were adjusted and the annual requested rental flow was determined. The requested rental rate, excluding operating costs and utilities, was calculated using the following formula.

$$Rental\ rate_{\text{o.c.}} = \frac{Price\ for\ rent\ per\ month}{Area} * 12\ month \quad (2)$$

The requested rental rate, excluding VAT, operating costs and utilities.

$$Rental\ rate_{vat,\text{o.c.}} = Rental\ rate_{\text{o.c.}} - \frac{Rental\ rate_{\text{o.c.}} * 20}{120} \quad (3)$$

If a VAT adjustment is necessary, we assume it is equal to 0.8. if no adjustment is necessary, the value of the requested rental rate does not change.

The requested annual rental flow is calculated using the formula.

$$RAR = Rental\ rate_{vat,\text{o.c.}} * Area - \left(\frac{Rental\ rate_{vat,\text{o.c.}} * Area}{100} * Trade\ adjustment\right) \quad (4)$$

Table 2. Selection of commercial real estate items by segment offered for rent.

№	Property type	Area, sq. m.	The asking rental rate, RUB/sq m, not including operating costs and utility bills	Adjustment for VAT	The asking rental rate, RUB/sq m, not including VAT, operating costs and utilities	Requested annual rental flow, RUB/year, excluding VAT, operating expenses and utilities
1	Offices	115,4	6000	0,8	5000	542380
2		76,3	6000	0,8	5000	358610
3		553,5	12744	0,8	10620	5525479,8
4		35,2	3600	0,8	3000	99264
5		254,8	6480,38	1	6480,38	1552128,77
6		4143,3	6597,64	0,8	5498,03	21413188,44
7		2128,5	9600	1	9600	19207584
8		996	6600	1	6600	6179184
9		833,4	15600	0,8	13000	10184148
10		821	4238,73	1	4238,73	3271197,49
1	Retail real estate	63,4	11356,47	1	11356,47	673200,19
2		88,6	9600	1	9600	795273,6
3		70	12000	1	12000	785400
4		154	7190,65	1	7190,65	1035381,69
5		163	8389,69	1	8389,69	1278630,7
6		958	1189,98	0,8	991,65	888250,65
7		845	9006,6	0,8	7505,5	5929907,91
8		844,5	8403,98	0,8	7003,32	5529874

9		598,9	3598	1	3598	2014777,46
10		537	8400	1	8400	4217598
1		336	4800	1	4800	1499904
2	Industrial	2000	1800	0,8	1500	2790000
3	and ware-	288,5	4200	1	4200	1126881
4	house real	194,6	2639,26	0,8	2199,38	398039,39
5	estate	260	2535	0,8	2112,5	510802,5
6		685	2433,6	0,8	2028	1291937,4

Next, the scattering diagrams were derived (see Fig. 7-9), in a manner similar to the previous method. The equation of the trend line was output automatically (y). R^2 is the OLS (coefficient of determination). The OX axis is the area (S, sq.m.), and OY is the requested annual rental flow for the specified sample (ARS, RUB.).

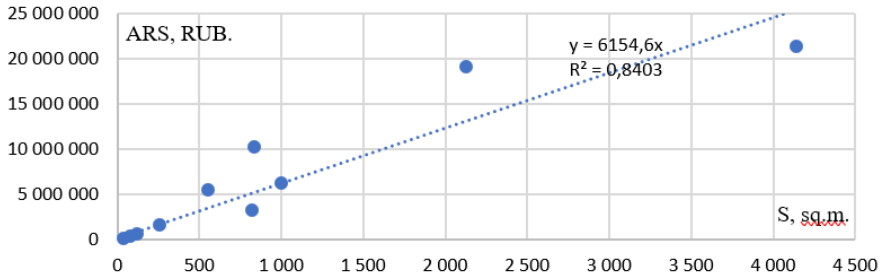

Figure 7. Scatter plot in coordinates "requested annual rental flow – area" for the specified sample for the office real estate segment.

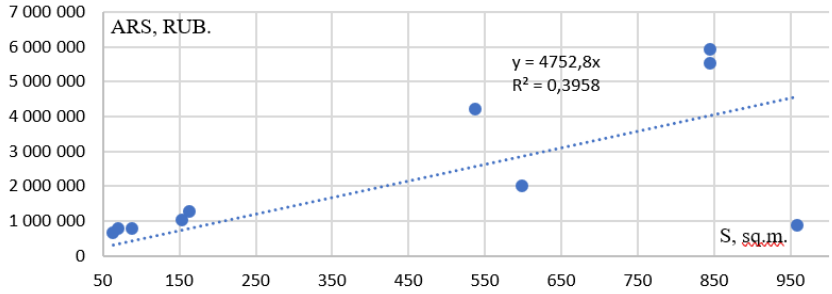

Figure 8. Scatter plot in coordinates "requested annual rental flow – area" for the specified sample for the retail real estate segment.

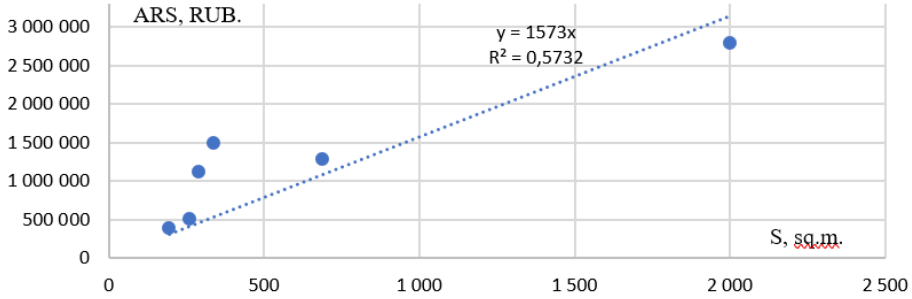

Figure 9. Scatter diagram in coordinates "requested annual rental flow – area" for the specified sample for the segment of production and warehouse real estate.

The high coefficient of determination of the approximating trend in the segments of offices and industrial and warehouse real estate indicates a high degree of correlation of the considered parameters.

Table 3 shows a selection of commercial real estate items by segment offered for sale. The unit values, the prices on the sale and price offers for sale comply with the algorithm of calculation of values in table 2.

Table 3. Selection of commercial real estate items by segment offered for sale.

№	Property type	Area, sq m	Specific offer price to sell, RUB/sq m	Adjustment for VAT	Specific offer price to sell, RUB/sq m + VAT	Offer price for sale, RUB; not including VAT
1	Offices	115,4	55000	0,8	45833,33	4813141,32
2		76,3	59000	0,8	49166,67	3413789,4
3		553,5	107000	0,8	89166,67	44911914,18
4		35,2	43000	0,8	35833,33	1147813,23
5		254,8	51020,41	0,8	42517,01	9858334,07
6		4143,3	65165,45	0,8	54304,54	204750000,5
7		2128,5	44632,37	1	44632,37	86449999,59
8		996	60000	1	60000	54381600
9		833,4	131989,4	1	131989,44	100099999,4
10		821	31668,7	1	31668,7	23660002,46
1	Retail real estate	63,4	89116,72	1	89116,72	5085000,04
2		88,6	90293,45	1	90293,45	7199999,7
3		70	121428,6	0,8	101190,48	6375000,24
4		154	59922,08	1	59922,08	8305200,29
5		163	73619,63	1	73619,63	10799999,72
6		958	24112,73	0,8	20093,95	17325003,69
7		845	73372,78	0,8	61143,98	46499996,79
8		844,5	73416,22	0,8	61180,19	46500003,41
9		598,9	73037,23	1	73037,23	39367797,34
10		537	65000	1	65000	31414500
1	Industrial and warehouse real estate	336	65000	1	65000	19437600
2		2000	17837,32	0,8	14864,44	26458703,2
3		288,5	45374,91	1	45374,91	11650688,77
4		194,6	15000,76	0,8	12500,63	2165034,11
5		260	16925,22	0,8	14104,35	3263746,59
6		685	23515	0,8	19595,84	11946603,86

Fig. 10-12 show the scattering diagrams, which are arranged in the same way as figures 7-9. The OX axis is the area (S, sq.m.), and OY is the requested annual rental flow for the specified sample (ARS, RUB.).

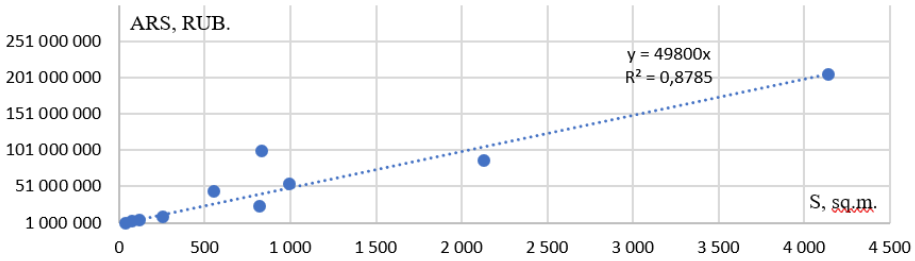

Figure 10. Scatter plot in coordinates "offer price for sale – area" for the specified sample for the office real estate segment.

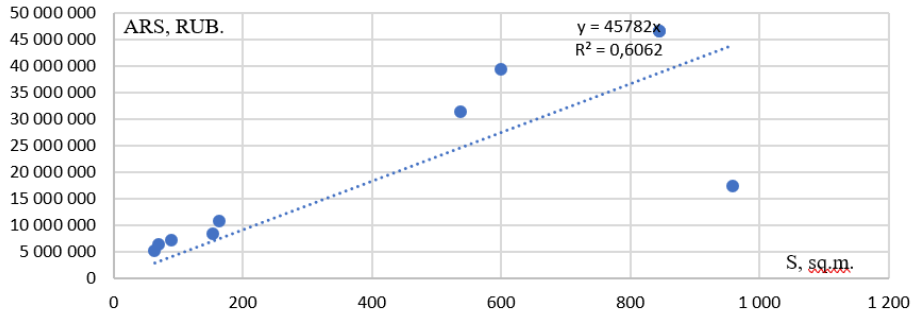

Figure 11. Scatter diagram in coordinates "offer price for sale – area" for the specified sample for the retail real estate segment.

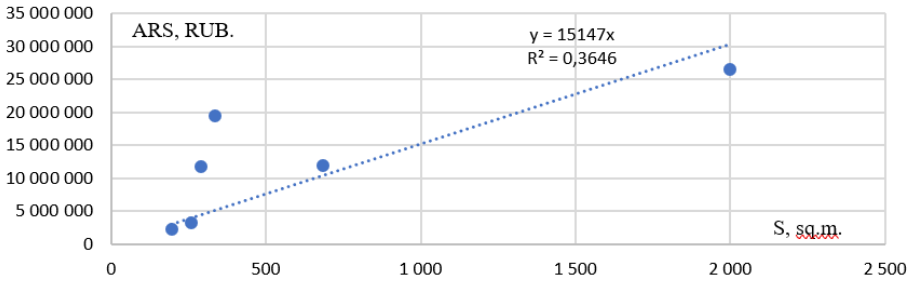

Figure 12. Scatter diagram in coordinates "offer price for sale – area" for the specified sample for the segment of production and warehouse real estate.

According to the above diagrams, a high coefficient of determination of the approximating trend in office real estate indicates a high degree of correlation of the considered parameters.

Next, we summarize the totals for sale and lease offers (table 4). The OLS values were presented in charts using the trend equation. The capitalization rate was calculated as the ratio of the requested rental rate to the unit price of the offer for sale.

Table 4. Summary of the data obtained and calculation of the capitalization rate.

Property type	Indicator	The asking rental rate, RUB/sq m, not including VAT, operating costs and utility bills	Specific offer price to sell, RUB/sq m + VAT	Capitalization revenue, Rel. units per year
Offices	minimum average	3000 6903,71	31668,7 58511,21	0,118

	median	5989,21	47500	0,126
	OLS (by the trend equation)	6154,6	49800	0,124
	maximum	13000	131989,44	
Retail real estate	minimum	991,65	20093,95	
	average	7603,53	69459,77	0,109
	median	7947,6	69018,62	0,115
	OLS (by the trend equation)	4752,8	45782	0,104
	maximum	12000	101190,48	
Industrial and warehouse real estate	minimum	1500	12500,63	
	average	2806,65	28573,36	0,098
	median	2155,94	17230,14	0,125
	OLS (by the trend equation)	1573	15147	0,104
	maximum	4800	65000	

Thus, the capitalization rate:
1) For office real estate in the city of Yekaterinburg is in the range of 0.12-0.13;
2) In retail real estate from 0.10 to 0.11;
3) In production and warehouse real estate from 0.10 to 0.12.

7. Comparison of the results obtained

Comparing the obtained intervals of the capitalization rate from the methods of a pair of groups and a group of pairs, the authors came to the following conclusions.

A more detailed analysis of commercial real estate objects in relation to their capitalization rates can be found in the group of pairs method (the second method). This is because this method considers sales and lease offers separately. This makes the analysis more detailed. This is also reflected in the size of the capitalization rate range.

The disadvantages of this approach are that this analysis is more voluminous and time-consuming.

8. Conclusions

The authors calculated the capitalization rates for the city of Yekaterinburg, which will further simplify the assessment of commercial real estate in this territory.

The study considered two approaches to obtaining the capitalization rate of commercial real estate, and also selected the most accurate method. It became the method of a pair of groups. According to this method, the ranking of capitalization rates is as follows:

1) Office real estate: 0.12-0.13 Rel. units per year;
2) Commercial real estate: 0.10-0.11 Rel. units per year;
3) Production and warehouse real estate: 0.10-0.12 Rel. units per year.

This algorithm, considered by the authors, can be successfully scaled to other cities and regions to find the optimal capitalization rate for commercial real estate.

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